PARISH'S ALKALI GRASS
Puccinellia parishii A. Hitchc.

Authors: Julie Greene, P.O. Box 451, Los Alamitos, CA 90720 and Andrew C. Sanders, Herbarium, Department of Botany and Plant Sciences, University of California, Riverside, CA 92521-0124

Management Status: Federal: None
California: S1.1; G1 (CDFG, 1998)
CNPS: List 1B, R-E-D Code 3-3-2 (Skinner and Pavlik, 1994)

General Distribution:

Parish's alkali grass is known from a few widely scattered locations in Arizona, New Mexico and California. The species is always very local in its specialized and limited habitat and even in these few sites is usually not common. There are eight locations in Arizona, seven around Tuba City in Coconino County, totaling approximately 400 plants (Phillips and Phillips, 1991) and one recently discovered along Little Shipp Wash near Bagdad in Yavapai County ("common", *A.L. Reina G. & T. R. Van Devender 96-192*, ARIZ, UCR). There is one reported population in New Mexico consisting of 200-5,000 plants (Phillips and Phillips, 1991).

Distribution in the West Mojave Planning Area:

There is only one known location in California, on privately owned land at Rabbit Springs near Lucerne Valley, San Bernardino County. Parish's alkali grass has never been found at any other location in California and an extensive search for the species in 1993, covering numerous apparently or potentially suitable sites in the western, southern and eastern Mojave Desert uncovered no additional populations (Sanders, 1993). However, it remains a possibility that this species does occur at unexplored seeps and springs on BLM lands within Joshua tree woodland and Creosote scrub communities of the Mojave Desert. In 1992, the Rabbit Springs population was estimated at 150 plants in a 500 square foot area, otherwise no plants had been reported there since 1950 (USFWS, 1994). Plants were observed at Rabbit Springs again in 1993 and were described as "fairly common" on both the N-central and NE edges of the seep (Sanders, 1993). Unfortunately, later, upon close examination of the plants in the herbarium under magnification, it was discovered that both Parish's alkali grass (*P. parishii*) and Great Valley alkali grass (*P. simplex*) were present among the specimens collected and so the proportion of each species present at Rabbit Springs is unknown. The exact identity of the 150 plants seen the previous year is also open to question because presumably both species were included in the counted populations. When collecting in 1950, J.C. Roos evidently noticed in the field that two taxa were present at Rabbit Springs because he carefully segregated the two species as separate collections, but he evidently was never able to identify the *P. simplex* material because it remained unidentified in his collection. Prior to 1993 it was apparently not known to active botanists that Great Valley alkali grass occurred at Rabbit Springs alongside Parish's alkali grass, despite the fact that the original description noted that the

type sheet of *P. parishii* consisted of a mixture with *P. simplex*. This is the only site where the two species are known to occur together.

Parish's alkali grass was reported in 1992 at the Air Force Flight Test Center, east of Rosamond Dry Lake, on Edwards Air Force Base (D. Charlton, pers. com. to J. Greene, 1995), but the specimens collected (*Charlton, s.n., 15 May 1992*, UCR) later turned out to be *P. simplex*. There was historically a problem in the identification of *Puccinellia parishii* because *P. simplex* was not reported for southern California in any of the floras available (e.g., Munz, 1959; 1974) prior to publication of the Jepson Manual (Hickman, 1993). *P. parishii* and *P. simplex* are very similar and any plant of this type identified using *A Flora of Southern California* (Munz, 1974) would have been identified as *P. parishii.*

Natural History:

Parish's alkali grass was originally described by A.S. Hitchcock in 1928 from specimens collected by Samuel B. Parish at Rabbit Springs, San Bernardino County, California (Hitchcock, 1971). This locality is a large alkaline spring in open desert which has formed a large spring mound by accumulation of sand and dust trapped by the dense vegetation supported by the spring (Sanders, pers. obs.). Most current seepage is from the north and northeast sides of this mound. The spring area is bisected by Rabbit Springs Road, which cuts across the low northern arm of the spring hill. The major seepage area, on the south side of Rabbit Springs Road, has been considerably altered by construction of a pond and by the fencing of pasture. Access to this area has not been available, but it appears that Puccinellia plants are very few in this zone. Along the eastern edge of the Rabbit Springs complex there is a flood control drainage ditch that crosses Rabbit Springs Road. Rabbit Springs Road, the drainage channel and the artificial pond probably all destroyed some Puccinellia habitat. Most of the remaining plants are in the unfenced area on the north side of Rabbit Springs Road, along the north to northeast foot of the spring hill.

Parish's alkali grass is a dwarf annual that germinates in winter and flowers in spring. All plants are dead by early summer. It forms small tufts with many ascending stems from the base. The inflorescence is a rather compressed spike-like panicle, with flowers in April and May. The plants are 1.25-9.5 in. (3-24 cm) tall and inconspicuous if not being actively sought. The cauline leaf blades are generally inrolled and less than 0.05 in. (1 mm) wide when flattened. Flowers are perfect (possess both male and female parts) and are probably strictly wind pollinated. The inflorescence (above the lowest panicle branches) is 0.4-3.5 in. (1-8 cm) long with the lower branches erect to reflexed in fruit; the spikelet stalks are scabrous. The lemmas are hairy in lower half, and have a tip that is obtuse to truncate. The lemma margin is scabrous-serrate near the tip. The lowest lemma is about 0.08 in. (2 mm) long; the anthers of the lowest floret are about 0.02 in. (0.5 mm) long. The plants can be taller and have more culms at base than *P. simplex*, but the diagnostic features separating the species are the lemma tip shape and the extent of pubescence on the lower half of the lemma. Despite their morphological similarity, the two annual alkali grasses are definitely distinct species with different chromosome numbers (Munz, 1959) and thus an inability to interbreed: *P. parishii* is diploid (2n=14), whereas *P. simplex* is octaploid (2n=56).

Habitat Requirements:

Parish's alkali grass occurs in very specific desert alkali seep and spring habitat. It is dependent on continuously wet or moist soil during the growing season, and population size therefore fluctuates widely depending on climatic conditions (USFWS, 1994) and rate of spring flow. *Puccinellia* occurs only in open moist sites with, apparently, strongly alkaline and/or saline water at the surface. *Puccinellia* is not found where there is dense vegetation or where water is not present at the surface for at least part (winter/spring) of the year. Sites occupied do not have rapidly moving water, but neither is the water completely stagnant. Typically the plants occupy areas of alkaline clay soil with water either moving intermittently across the surface in a thin sheet or the margins of low gradient rivulets that carry water during the moist part of the year. It appears that *Puccinellia parishii* occupies sites that are too ecologically difficult for many other species and thus that it is able to avoid competition rather than being able to overcome it. It may be a refugee species occupying sites where there are few other species present to compete with it.

In California, the one known site is at an elevation of 2870 ft. (875 m). In Arizona the Bagdad population is at a similar elevation, but the Tuba City populations are at about 5000 ft. (1500 m).

The highly disjunct and specialized habitat of Parish's alkali grass strongly suggests it is a species that was formerly more widespread during periods when conditions across the Mojave Desert were moister than they are today. It is possible that there were once fairly continuous populations of this species at springs and along intermittent streams that fed into what are now the large dry lakes of the Mojave Desert of California and Arizona. The species seems to have persisted better in the moister areas to the east and at just the one site in California where there is an alkaline spring fed by runoff from the high San Bernardino Mountains. It may be that Rabbit Springs has been continuously wet since the Pleistocene, or before, and hence the large spring mound and the persistence of *Puccinellia parishii*.

Population Status:

The one known Californian population does not have any sort of protection. Furthermore, there is no reliable information on either the size of the population or the magnitude of population fluctuations. It is known that the population is more likely in the hundreds rather than the thousands, but could easily be less than 100 in many years. Because of the confusion with *B. simplex* this cannot be definitely determined from the existing limited information.

Threats Analysis:

Any activity that alters the soil moisture content around Rabbit Springs such as ground water pumping or flood control would likely affect this species (Skinner and Pavlik, 1994). The area around Rabbit Springs has already been developed for what seems to be livestock use, and further development, especially water development, could potentially alter the hydrology of the area (USFWS, 1994). Anything causing the lowering of the water table at Rabbit Springs will likely result in the destruction of the

only known California population of this species, as this plant is absolutely dependent upon continued surface flows for its existence. Water is an increasingly valuable commodity in southern California, and especially on the Mojave Desert. There is a probability that there will be a continued increase in the rate of development and use of the groundwater resources in the Lucerne Valley area. This could easily result in the lowering of the local water table and consequent death of much vegetation, as has happened in the Coachella Valley near Palm Springs (Sanders, pers. obs.). The drying of Rabbit Springs, even for a relatively short period of time, could have catastrophic effects on the Parish's alkali grass population. Most annual grasses have very short lived seeds and are dependent on at least some reproduction every year to maintain populations. Even a single year when the spring does not flow may be sufficient to eliminate *P. parishii* from California.

There is significant weed invasion of the *Puccinellia parishii* habitat. Several exotic species are present in substantial numbers (Sanders, pers. obs.), and given the apparent inability of *Puccinellia parishii* to compete with dense stands of other vegetation this represents a direct threat to its populations. Several of the invasive species are distinctly salt tolerant and may thus have already occupied sites formerly the almost exclusive domain of *Puccinellia*.

Livestock have access to most of the currently known sites of Parish's alkali grass, and although it appears that cattle do not graze this grass, damage is likely from trampling, increased erosion and soil disturbance (USFWS, 1994).

Perhaps the most significant long-term threat to Parish's alkali grass is the potential of urban or low density rural residential occupation of its habitat. Human populations have been growing rapidly on the southern and western Mojave Desert, especially in the Victorville/Hesperia area to the west, as well as in the Yucca Valley and Landers areas to the east. The Lucerne Valley area is still quite isolated and development pressures are currently not significant, but as human populations in adjacent areas continue to grow, development pressures in the Lucerne valley area will doubtless increase. The fact that Parish's alkali grass occupies one minute site in California, little larger that a typical residential lot, puts it in extreme jeopardy if even a single residence is constructed in the wrong location.

Biological Standards:

The conservation of this species is a particular challenge because it faces two major threats: habitat conversion and water table lowering. The fact that Parish's alkali grass occupies only one site in California further magnifies the threat. Public or private conservation oriented acquisition of the occupied property must be a high priority. Without surface protection there is little hope that the species can be conserved. Equally important is interaction with local water authorities regarding possible measures necessary to maintain (or restore?) the water table at its historic level. Much could be done at Rabbit Springs to improve the existing habitat conditions. There is a need to remove or modify existing obstructions to natural spring or seep flows and to prevent direct human and livestock impact on the remaining populations. Removal of competing weed species would also be desirable. It would be desirable to search for previously unknown populations in other likely habitat areas and to monitor and carefully map the known

population. As a safety measure, up to 5% of the available seed per year should be collected and used for seed multiplication and storage in a seed storage bank, such as the rare plant seed storage and research facility at Rancho Santa Ana Botanic Garden in Claremont, California. This will also provide an opportunity to investigate the biology of this plant, including germination requirements and genetic diversity, so that existing wild populations can be understood and managed.

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